



#8

SEQUENCE LISTING

<110> Gravel, Roy A,
Rozen, Rima
Leclerc, Daniel
Wilson, Aaron
Rosenblatt, David

<120> HUMAN METHIONINE SYNTHASE REDUCTASE:
CLONING, AND METHODS FOR EVALUATING RISK OF NEURAL TUBE
DEFECTS, CARDIOVASCULAR DISEASE, AND CANCER

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Pro Pro Asp Thr Ala Arg Lys Phe Val Lys Glu Ile Gln Asn Gln Thr
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130     135     140
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Glu Glu Ile Ser Gly Ala Leu Pro Val Ala Ser Pro Ala Ser Leu Arg
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Thr Asp Leu Val Lys Ser Glu Leu Leu His Ile Glu Ser Gln Val Glu
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225     230     235
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Ser Leu Gly Gln Glu Glu Ser Gln Val Ser Val Thr Ser Ala Asp Pro
260     265     270
Val Phe Gln Val Pro Ile Ser Lys Ala Val Gln Leu Thr Thr Asn Asp
275     280     285
Ala Ile Lys Thr Thr Leu Leu Val Glu Leu Asp Ile Ser Asn Thr Asp
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 65 70 75 80
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 Gly Asp Ser Glu Tyr Thr Tyr Phe Cys Asn Gly Gly Lys Ile Ile Asp
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 Lys Arg Leu Gln Glu Leu Gly Ala Arg His Phe Tyr Asp Thr Gly His
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Gly Ala Thr Leu Pro Gln His Ile Pro Ala Gly Cys Ser Leu Gln Phe				
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Thr Glu Val Leu Arg Lys Gly Val Cys Thr Gly Trp Leu Ala Leu Leu				
	485		490	495
Val Ala Ser Val Leu Gln Pro Asn Ile His Ala Ser His Glu Asp Ser				
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Gly Lys Ala Leu Ala Pro Lys Ile Ser Ile Ser Pro Arg Thr Thr Asn				
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Ser Phe His Leu Pro Asp Asp Pro Ser Ile Pro Ile Ile Met Val Gly				
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Pro Gly Thr Gly Ile Ala Pro Phe Ile Gly Phe Leu Gln His Arg Glu				
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Lys Leu Gln Glu Gln His Pro Asp Gly Asn Phe Gly Ala Met Trp Leu				
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Phe Phe Gly Cys Arg His Lys Asp Arg Asp Tyr Leu Phe Arg Lys Glu				
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Leu Gln Glu Asn Gly His Ile Tyr Val Cys Gly Asp Ala Lys Asn Met				
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Ala Lys Asp Val His Asp Ala Leu Val Gln Ile Ile Ser Lys Glu Val				
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Leu	Pro	Arg	Leu	Ile	Pro	Arg	Pro	Tyr	Ser	Met	Ser	Ser	Tyr	Glu	Asn
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Phe Arg Leu Pro Pro Leu Gly Met Thr Lys Asn Ser Ala Gly Lys Leu						
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Thr Tyr Glu His Phe Asn Ala Met Gly Lys Tyr Val Asp Lys Arg Leu	
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Ser	Ile	Arg	Gln	Tyr	Glu	Leu	Val	Val	His	Thr	Asp	Ile	Asp	Ala	Ala
			245						250					255	
Lys	Val	Tyr	Met	Gly	Glu	Met	Gly	Arg	Leu	Lys	Ser	Tyr	Glu	Asn	Gln
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		275					280					285			
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Leu	Asp	Ile	Ser	Asp	Ser	Lys	Ile	Arg	Tyr	Glu	Ser	Gly	Asp	His	Val
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Ala	Val	Tyr	Pro	Ala	Asn	Asp	Ser	Ala	Leu	Val	Asn	Gln	Leu	Gly	Lys
			325					330					335		
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		340					345						350		
Glu	Glu	Ser	Asn	Lys	Lys	His	Pro	Phe	Pro	Cys	Pro	Thr	Ser	Tyr	Arg
		355					360					365			
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Leu	Leu	Arg	Lys	Met	Ala	Ser	Ser	Ser	Gly	Glu	Gly	Lys	Glu	Leu	Tyr
			405						410				415		
Leu	Ser	Trp	Val	Val	Glu	Ala	Arg	Arg	His	Ile	Leu	Ala	Ile	Leu	Gln
		420					425						430		
Asp	Cys	Pro	Ser	Leu	Arg	Pro	Pro	Ile	Asp	His	Leu	Cys	Glu	Leu	Leu
	435					440					445				
Pro	Arg	Leu	Gln	Ala	Arg	Tyr	Tyr	Ser	Ile	Ala	Ser	Ser	Ser	Lys	Val
	450					455				460					
His	Pro	Asn	Ser	Val	His	Ile	Cys	Ala	Val	Val	Val	Glu	Tyr	Glu	Thr
	465				470					475					480
Lys	Ala	Gly	Arg	Ile	Asn	Lys	Gly	Val	Ala	Thr	Asn	Trp	Leu	Arg	Ala
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Lys	Glu	Pro	Val	Gly	Glu	Asn	Gly	Gly	Arg	Ala	Leu	Val	Pro	Met	Phe
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			580				585					590			
Val	Ala	Phe	Ser	Arg	Glu	Gln	Ser	His	Lys	Val	Tyr	Val	Gln	His	Leu
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Leu	Lys	Gln	Asp	Arg	Glu	His	Leu	Trp	Lys	Leu	Ile	Glu	Gly	Gly	Ala
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Asn	Thr	Phe	Tyr	Asp	Ile	Val	Ala	Glu	Leu	Gly	Ala	Met	Glu	His	Ala
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665

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 <213> Homo sapiens

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 1 5 10 15
 Leu Phe

<210> 26
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<400> 26
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 1 5 10 15
 Leu Tyr

<210> 27
 <211> 18
 <212> PRT
 <213> Oryctolagus cuniculus

<400> 27
 Gly Glu Thr Leu Leu Tyr Tyr Gly Cys Arg Arg Ala Ala Glu Asp Tyr
 1 5 10 15
 Leu Tyr

<210> 28
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 <213> Drosophila melanogaster

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 1 5 10 15
 Ile Tyr

<210> 29
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<213> Vigna radiata

<400> 29

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<213> Aspergillus niger

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Leu	Tyr														

<210> 31

<211> 18

<212> PRT

<213> Homo sapiens

<400> 31

Cys	Pro	Met	Val	Leu	Val	Phe	Gly	Cys	Arg	Gln	Ser	Lys	Ile	Asp	His
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Ile	Tyr														

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<211> 18

<212> PRT

<213> Homo sapiens

<400> 32

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1				5					10					15	
Ile	Tyr														

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<211> 18

<212> PRT

<213> Homo sapiens

<400> 33

Thr	Pro	Met	Thr	Leu	Val	Phe	Gly	Cys	Arg	Cys	Ser	Gln	Leu	Asp	His
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Leu	Tyr														

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<211> 18

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1 5 10 15
Leu Tyr

<210> 35
<211> 18
<212> PRT
<213> *Gallus gallus*

<400> 35
Gly Asp Met Ile Leu Leu Phe Gly Cys Arg His Pro Asp Met Asp His
1 5 10 15
Ile Tyr

<210> 36
<211> 18
<212> PRT
<213> *Escherichia coli*

<400> 36
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1 5 10 15
Leu Tyr

<210> 37
<211> 18
<212> PRT
<213> *Saccharomyces cerevisiae*

<400> 37
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1 5 10 15
Leu Tyr

<210> 38
<211> 18
<212> PRT
<213> *Thiocapsa roseopersicina*

<400> 38
Gly Arg Asn Trp Leu Ile Phe Gly Asn Arg His Phe His Arg Asp Phe
1 5 10 15
Leu Tyr

<210> 39

<211> 19
 <212> PRT
 <213> Pisum sativum

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 1 5 10 15
 Tyr Asp Asp

<210> 40
 <211> 18
 <212> PRT
 <213> Spinacia oleracea

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 1 5 10 15
 Tyr Lys

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 <211> 2097
 <212> DNA
 <213> Homo sapiens

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<212> PRT
<213> Homo sapiens

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35 40 45
Glu Thr Ala Pro Leu Val Val Val Val Ser Thr Thr Gly Thr Gly Asp
50 55 60
Pro Pro Asp Thr Ala Arg Lys Phe Val Lys Glu Ile Gln Asn Gln Thr
65 70 75 80
Leu Pro Val Asp Phe Phe Ala His Leu Arg Tyr Gly Leu Leu Gly Leu
85 90 95
Gly Asp Ser Glu Tyr Thr Tyr Phe Cys Asn Gly Gly Lys Ile Ile Asp
100 105 110
Lys Arg Leu Gln Glu Leu Gly Ala Arg His Phe Tyr Asp Thr Gly His
115 120 125
Ala Asp Asp Cys Val Gly Leu Glu Leu Val Val Glu Pro Trp Ile Ala
130 135 140
Gly Leu Trp Pro Ala Leu Arg Lys His Phe Arg Ser Ser Arg Gly Gln
145 150 155 160
Glu Glu Ile Ser Gly Ala Leu Pro Val Ala Ser Pro Ala Ser Leu Arg
165 170 175
Thr Asp Leu Val Lys Ser Glu Leu Leu His Ile Glu Ser Gln Val Glu
180 185 190
Leu Leu Arg Phe Asp Asp Ser Gly Arg Lys Asp Ser Glu Val Leu Lys
195 200 205
Gln Asn Ala Val Asn Ser Asn Gln Ser Asn Val Val Ile Glu Asp Phe
210 215 220
Glu Ser Ser Leu Thr Arg Ser Val Pro Pro Leu Ser Gln Ala Ser Leu
225 230 235 240
Asn Ile Pro Gly Leu Pro Pro Glu Tyr Leu Gln Val His Leu Gln Glu
245 250 255
Ser Leu Gly Gln Glu Glu Ser Gln Val Ser Val Thr Ser Ala Asp Pro
260 265 270
Val Phe Gln Val Pro Ile Ser Lys Ala Val Gln Leu Thr Thr Asn Asp
275 280 285
Ala Ile Lys Thr Thr Leu Leu Val Glu Leu Asp Ile Ser Asn Thr Asp
290 295 300
Phe Ser Tyr Gln Pro Gly Asp Ala Phe Ser Val Ile Cys Pro Asn Ser
305 310 315 320
Asp Ser Glu Val Gln Ser Leu Leu Gln Arg Leu Gln Leu Glu Asp Lys
325 330 335
Arg Glu His Cys Val Leu Leu Lys Ile Lys Ala Asp Thr Lys Lys Lys
340 345 350
Gly Ala Thr Leu Pro Gln His Ile Pro Ala Gly Cys Ser Leu Gln Phe
355 360 365
Ile Phe Thr Trp Cys Leu Glu Ile Arg Ala Ile Pro Lys Lys Ala Phe

370	375	380
Leu Arg Ala Leu Val Asp Tyr Thr Ser Asp Ser Ala Glu Lys Arg Arg		
385	390	395
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	405	410
Val Arg Asp Ala Cys Ala Cys Leu Leu Asp Leu Leu Leu Ala Phe Pro		415
	420	425
Ser Cys Gln Pro Pro Leu Ser Leu Leu Leu Glu His Leu Pro Lys Leu		430
	435	440
Gln Pro Arg Pro Tyr Ser Cys Ala Ser Ser Ser Leu Phe His Pro Gly		445
	450	455
Lys Leu His Phe Val Phe Asn Ile Val Glu Phe Leu Ser Thr Ala Thr		460
465	470	475
Thr Glu Val Leu Arg Lys Gly Val Cys Thr Gly Trp Leu Ala Leu Leu		480
	485	490
Val Ala Ser Val Leu Gln Pro Asn Ile His Ala Ser His Glu Asp Ser		495
	500	505
Gly Lys Ala Leu Ala Pro Lys Ile Ser Ile Ser Pro Arg Thr Thr Asn		510
	515	520
Ser Phe His Leu Pro Asp Asp Pro Ser Ile Pro Ile Ile Met Val Gly		525
	530	535
Pro Gly Thr Gly Ile Ala Pro Phe Ile Gly Phe Leu Gln His Arg Glu		540
545	550	555
Lys Leu Gln Glu Gln His Pro Asp Gly Asn Phe Gly Ala Met Trp Leu		560
	565	570
Phe Phe Gly Cys Arg His Lys Asp Arg Asp Tyr Leu Phe Arg Lys Glu		575
	580	585
Leu Arg His Phe Leu Lys His Gly Ile Leu Thr His Leu Lys Val Ser		590
	595	600
Phe Ser Arg Asp Ala Pro Val Gly Glu Glu Glu Ala Pro Ala Lys Tyr		605
	610	615
Val Gln Asp Asn Ile Gln Leu His Gly Gln Gln Val Ala Arg Ile Leu		620
625	630	635
Leu Gln Glu Asn Gly His Ile Tyr Val Cys Gly Asp Ala Lys Asn Met		640
	645	650
Ala Lys Asp Val His Asp Ala Leu Val Gln Ile Ile Ser Lys Glu Val		655
	660	665
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Glu Lys Arg Tyr Leu Gln Asp Ile Trp Ser		685
690	695	

<210> 43
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 <212> DNA
 <213> Homo sapiens

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<210> 44
 <211> 698
 <212> PRT
 <213> Homo sapiens

<400> 44

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Ala	Asp	Leu	His	Thr	Ile	Ser	Glu	Ser	Asp	Lys	Tyr	Asp	Leu	Lys	Thr
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Glu	Thr	Ala	Pro	Leu	Val	Val	Val	Val	Ser	Thr	Thr	Gly	Thr	Gly	Asp
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Pro	Pro	Asp	Thr	Ala	Arg	Lys	Phe	Val	Lys	Glu	Ile	Gln	Asn	Gln	Thr
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Leu	Pro	Val	Asp	Phe	Phe	Ala	His	Leu	Arg	Tyr	Gly	Leu	Leu	Gly	Leu
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Gly	Asp	Ser	Glu	Tyr	Thr	Tyr	Phe	Cys	Asn	Gly	Gly	Lys	Ile	Ile	Asp
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Lys	Arg	Leu	Gln	Glu	Leu	Gly	Ala	Arg	His	Phe	Tyr	Asp	Thr	Gly	His
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Ala	Asp	Asp	Cys	Val	Gly	Leu	Glu	Leu	Val	Val	Glu	Pro	Trp	Ile	Ala
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Gly	Leu	Trp	Pro	Ala	Leu	Arg	Lys	His	Phe	Arg	Ser	Ser	Arg	Gly	Gln
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Glu	Glu	Ile	Ser	Gly	Ala	Leu	Pro	Val	Ala	Ser	Pro	Ala	Ser	Leu	Arg
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Thr	Asp	Leu	Val	Lys	Ser	Glu	Leu	Leu	His	Ile	Glu	Ser	Gln	Val	Glu
		180					185						190		
Leu	Leu	Arg	Phe	Asp	Asp	Ser	Gly	Arg	Lys	Asp	Ser	Glu	Val	Leu	Lys
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Gln	Asn	Ala	Val	Asn	Ser	Asn	Gln	Ser	Asn	Val	Val	Ile	Glu	Asp	Phe

210		215		220
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		245		250
Ser Leu Gly Gln Glu Glu Ser Gln Val Ser Val Thr Ser Ala Asp Pro				255
		260		265
Val Phe Gln Val Pro Ile Ser Lys Ala Val Gln Leu Thr Thr Asn Asp				270
		275		280
Ala Ile Lys Thr Thr Leu Leu Val Glu Leu Asp Ile Ser Asn Thr Asp				285
		290		295
Phe Ser Tyr Gln Pro Gly Asp Ala Phe Ser Val Ile Cys Pro Asn Ser				300
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Asp Ser Glu Val Gln Ser Leu Leu Gln Arg Leu Gln Leu Glu Asp Lys				315
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Arg Glu His Cys Val Leu Leu Lys Ile Lys Ala Asp Thr Lys Lys Lys				335
		340		345
Gly Ala Thr Leu Pro Gln His Ile Pro Ala Gly Cys Ser Leu Gln Phe				350
		355		360
Ile Phe Thr Trp Cys Leu Glu Ile Arg Ala Ile Pro Lys Lys Ala Phe				365
		370		375
Leu Arg Ala Leu Val Asp Tyr Thr Ser Asp Ser Ala Glu Lys Arg Arg				380
		385		390
Leu Gln Glu Leu Cys Ser Lys Gln Gly Ala Ala Asp Tyr Ser Arg Phe				395
		405		410
Val Arg Asp Ala Cys Ala Cys Leu Leu Asp Leu Leu Leu Ala Phe Pro				415
		420		425
Ser Cys Gln Pro Pro Leu Ser Leu Leu Leu Glu His Leu Pro Lys Leu				430
		435		440
Gln Pro Arg Pro Tyr Ser Cys Ala Ser Ser Ser Leu Phe His Pro Gly				445
		450		455
Lys Leu His Phe Val Phe Asn Ile Val Glu Phe Leu Ser Thr Ala Thr				460
		465		470
Thr Glu Val Leu Arg Lys Gly Val Cys Thr Gly Trp Leu Ala Leu Leu				475
		485		490
Val Ala Ser Val Leu Gln Pro Asn Ile His Ala Ser His Glu Asp Ser				495
		500		505
Gly Lys Ala Leu Ala Pro Lys Ile Ser Ile Ser Pro Arg Thr Thr Asn				510
		515		520
Ser Phe His Leu Pro Asp Asp Pro Ser Ile Pro Ile Ile Met Val Gly				525
		530		535
Pro Gly Thr Gly Ile Ala Pro Phe Ile Gly Phe Leu Gln His Arg Glu				540
		545		550
Lys Leu Gln Glu Gln His Pro Asp Gly Asn Phe Gly Ala Met Trp Leu				555
		565		570
Phe Phe Gly Cys Arg His Lys Asp Arg Asp Tyr Leu Phe Arg Lys Glu				575
		580		585
Leu Arg His Phe Leu Lys His Gly Ile Leu Thr His Leu Lys Val Ser				590
		595		600
Phe Ser Arg Asp Ala Pro Val Gly Glu Glu Glu Ala Pro Ala Lys Tyr				605
		610		615
Val Gln Asp Asn Ile Gln Leu His Gly Gln Gln Val Ala Arg Ile Leu				620
		625		630
Leu Gln Glu Asn Gly His Ile Tyr Val Cys Gly Asp Ala Lys Asn Met				635
		645		650
Ala Lys Asp Val His Asp Ala Leu Val Gln Ile Ile Ser Lys Glu Val				655
		660		665
Gly Val Glu Lys Leu Glu Ala Met Lys Thr Leu Ala Thr Leu Lys Glu				670
		675		680
				685

Glu Lys Arg Tyr Leu Gln Asp Ile Trp Ser
690 695

<210> 45
<211> 2094
<212> DNA
<213> Homo sapiens

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<210> 46
<211> 697
<212> PRT
<213> Homo sapiens

<400> 46
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35 40 45
Glu Thr Ala Pro Leu Val Val Val Ser Thr Thr Gly Thr Gly Asp

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Pro Pro Asp Thr Ala	Arg Lys Phe Val Lys Glu Ile Gln Asn Gln Thr	
65	70	75
Leu Pro Val Asp Phe	Ala His Leu Arg Tyr Gly Leu Leu Gly Leu	80
	85	90
Gly Asp Ser Glu Tyr Thr Tyr Phe Cys Asn Gly Gly Lys Ile Ile Asp		95
	100	105
Lys Arg Leu Gln Glu Leu Gly Ala Arg His Phe Tyr Asp Thr Gly His		110
	115	120
Ala Asp Asp Cys Val Gly Leu Glu Leu Val Val Glu Pro Trp Ile Ala		125
	130	135
Gly Leu Trp Pro Ala Leu Arg Lys His Phe Arg Ser Ser Arg Gly Gln		140
145	150	155
Glu Glu Ile Ser Gly Ala Leu Pro Val Ala Ser Pro Ala Ser Leu Arg		160
	165	170
Thr Asp Leu Val Lys Ser Glu Leu Leu His Ile Glu Ser Gln Val Glu		175
	180	185
Leu Leu Arg Phe Asp Asp Ser Gly Arg Lys Asp Ser Glu Val Leu Lys		190
	195	200
Gln Asn Ala Val Asn Ser Asn Gln Ser Asn Val Val Ile Glu Asp Phe		205
	210	215
Glu Ser Ser Leu Thr Arg Ser Val Pro Pro Leu Ser Gln Ala Ser Leu		220
225	230	235
Asn Ile Pro Gly Leu Pro Pro Glu Tyr Leu Gln Val His Leu Gln Glu		240
	245	250
Ser Leu Gly Gln Glu Glu Ser Gln Val Ser Val Thr Ser Ala Asp Pro		255
	260	265
Val Phe Gln Val Pro Ile Ser Lys Ala Val Gln Leu Thr Thr Asn Asp		270
	275	280
Ala Ile Lys Thr Thr Leu Leu Val Glu Leu Asp Ile Ser Asn Thr Asp		285
	290	295
Phe Ser Tyr Gln Pro Gly Asp Ala Phe Ser Val Ile Cys Pro Asn Ser		300
305	310	315
Asp Ser Glu Val Gln Ser Leu Leu Gln Arg Leu Gln Leu Glu Asp Lys		320
	325	330
Arg Glu His Cys Val Leu Leu Lys Ile Lys Ala Asp Thr Lys Lys Lys		335
	340	345
Gly Ala Thr Leu Pro Gln His Ile Pro Ala Gly Cys Ser Leu Gln Phe		350
	355	360
Ile Phe Thr Trp Cys Leu Glu Ile Arg Ala Ile Pro Lys Lys Ala Phe		365
	370	375
Leu Arg Ala Leu Val Asp Tyr Thr Ser Asp Ser Ala Glu Lys Arg Arg		380
385	390	395
Leu Gln Glu Leu Cys Ser Lys Gln Gly Ala Ala Asp Tyr Ser Arg Phe		400
	405	410
Val Arg Asp Ala Cys Ala Cys Leu Leu Asp Leu Leu Leu Ala Phe Pro		415
	420	425
Ser Cys Gln Pro Pro Leu Ser Leu Leu Leu Glu His Leu Pro Lys Leu		430
	435	440
Gln Pro Arg Pro Tyr Ser Cys Ala Ser Ser Ser Leu Phe His Pro Gly		445
	450	455
Lys Leu His Phe Val Phe Asn Ile Val Glu Phe Leu Ser Thr Ala Thr		460
465	470	475
Thr Glu Val Leu Arg Lys Gly Val Cys Thr Gly Trp Leu Ala Leu Leu		480
	485	490
Val Ala Ser Val Leu Gln Pro Asn Ile His Ala Ser His Glu Asp Ser		495
	500	505
Gly Lys Ala Leu Ala Pro Lys Ile Ser Ile Ser Pro Arg Thr Thr Asn		510
	515	520
		525

Ser	Phe	His	Leu	Pro	Asp	Asp	Pro	Ser	Ile	Pro	Ile	Ile	Met	Val	Gly
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Pro	Gly	Thr	Gly	Ile	Ala	Pro	Phe	Ile	Gly	Phe	Leu	Gln	His	Arg	Glu
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Lys	Leu	Gln	Glu	Gln	His	Pro	Asp	Gly	Asn	Phe	Gly	Ala	Met	Trp	Phe
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Phe	Gly	Cys	Arg	His	Lys	Asp	Arg	Asp	Tyr	Leu	Phe	Arg	Lys	Glu	Leu
			580					585					590		
Arg	His	Phe	Leu	Lys	His	Gly	Ile	Leu	Thr	His	Leu	Lys	Val	Ser	Phe
		595					600					605			
Ser	Arg	Asp	Ala	Pro	Val	Gly	Glu	Glu	Glu	Ala	Pro	Ala	Lys	Tyr	Val
610						615					620				
Gln	Asp	Asn	Ile	Gln	Leu	His	Gly	Gln	Gln	Val	Ala	Arg	Ile	Leu	Leu
625					630					635					640
Gln	Glu	Asn	Gly	His	Ile	Tyr	Val	Cys	Gly	Asp	Ala	Lys	Asn	Met	Ala
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Lys	Asp	Val	His	Asp	Ala	Leu	Val	Gln	Ile	Ile	Ser	Lys	Glu	Val	Gly
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Val	Glu	Lys	Leu	Glu	Ala	Met	Lys	Thr	Leu	Ala	Thr	Leu	Lys	Glu	Glu
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<210> 47
 <211> 2093
 <212> DNA
 <213> Homo sapiens

<400> 47

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<210> 48
 <211> 689
 <212> PRT
 <213> Homo sapiens

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 35 40 45
 Thr Ala Pro Leu Val Val Val Val Ser Thr Thr Gly Thr Gly Asp Pro
 50 55 60
 Pro Asp Thr Ala Arg Lys Phe Val Lys Glu Ile Gln Asn Gln Thr Leu
 65 70 75 80
 Pro Val Asp Phe Phe Ala His Leu Arg Tyr Gly Leu Leu Gly Leu Gly
 85 90 95
 Asp Ser Glu Tyr Thr Tyr Phe Cys Asn Gly Gly Lys Ile Ile Asp Lys
 100 105 110
 Arg Leu Gln Glu Leu Gly Ala Arg His Phe Tyr Asp Thr Gly His Ala
 115 120 125
 Asp Asp Cys Val Gly Leu Glu Leu Val Val Glu Pro Trp Ile Ala Gly
 130 135 140
 Leu Trp Pro Ala Leu Arg Lys His Phe Arg Ser Ser Arg Gly Gln Glu
 145 150 155 160
 Glu Ile Ser Gly Ala Leu Pro Val Ala Ser Pro Ala Ser Leu Arg Thr
 165 170 175
 Asp Leu Val Lys Ser Glu Leu Leu His Ile Glu Ser Gln Val Glu Leu
 180 185 190
 Leu Arg Phe Asp Asp Ser Gly Arg Lys Asp Ser Glu Val Leu Lys Gln
 195 200 205
 Asn Ala Val Asn Ser Asn Gln Ser Asn Val Val Ile Glu Asp Phe Glu
 210 215 220
 Ser Ser Leu Thr Arg Ser Val Pro Pro Leu Ser Gln Ala Ser Leu Asn
 225 230 235 240
 Ile Pro Gly Leu Pro Pro Glu Tyr Leu Gln Val His Leu Gln Glu Ser
 245 250 255
 Leu Gly Gln Glu Glu Ser Gln Val Ser Val Thr Ser Ala Asp Pro Val
 260 265 270
 Phe Gln Val Pro Ile Ser Lys Ala Val Gln Leu Thr Thr Asn Asp Ala
 275 280 285
 Ile Lys Thr Thr Leu Leu Val Glu Leu Asp Ile Ser Asn Thr Asp Phe
 290 295 300
 Ser Tyr Gln Pro Gly Asp Ala Phe Ser Val Ile Cys Pro Asn Ser Asp
 305 310 315 320
 Ser Glu Val Gln Ser Leu Leu Gln Arg Leu Gln Leu Glu Asp Lys Arg
 325 330 335
 Glu His Cys Val Leu Leu Lys Ile Lys Ala Asp Thr Lys Lys Lys Gly
 340 345 350
 Ala Thr Leu Pro Gln His Ile Pro Ala Gly Cys Ser Leu Gln Phe Ile
 355 360 365

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385					390					395					400
Gln	Glu	Leu	Cys	Ser	Lys	Gln	Gly	Ala	Ala	Asp	Tyr	Ser	Arg	Phe	Val
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Arg	Asp	Ala	Cys	Ala	Cys	Leu	Leu	Asp	Leu	Leu	Leu	Ala	Phe	Pro	Ser
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Cys	Gln	Pro	Pro	Leu	Ser	Leu	Leu	Leu	Glu	His	Leu	Pro	Lys	Leu	Gln
	435					440					445				
Pro	Arg	Pro	Tyr	Ser	Cys	Ala	Ser	Ser	Ser	Leu	Phe	His	Pro	Gly	Lys
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465					470					475					480
Glu	Val	Leu	Arg	Lys	Gly	Val	Cys	Thr	Gly	Trp	Leu	Ala	Leu	Leu	Val
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Ala	Ser	Val	Leu	Gln	Pro	Asn	Ile	His	Ala	Ser	His	Glu	Asp	Ser	Gly
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Lys	Ala	Leu	Ala	Pro	Lys	Ile	Ser	Ile	Ser	Pro	Arg	Thr	Thr	Asn	Ser
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Lys	Asn	Asn	Thr	Gln	Met	Glu	Ile	Leu	Glu	Gln	Cys	Gly	Cys	Phe	Leu
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Ala	Ala	Gly	Ile	Arg	Ile	Gly	Ile	Ile	Tyr	Ser	Glu	Lys	Ser	Ser	Asp
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Ile	Ser	Leu	Ser	Met	Gly	Ser	Leu	Ile	Arg	Phe	Pro	Ser	Gln	Glu	Met
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Leu	Leu	Leu	Gly	Arg	Arg	Lys	Pro	Gln	Gln	Ser	Met	Tyr	Lys	Thr	Thr
	610					615					620				
Ser	Ser	Phe	Met	Ala	Ser	Arg	Trp	Arg	Glu	Ser	Ser	Ser	Arg	Arg	Thr
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Ala	Ile	Phe	Met	Cys	Val	Glu	Met	Gln	Arg	Ile	Trp	Pro	Arg	Met	Tyr
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Met	Met	Pro	Leu	Cys	Lys	Ala	Lys	Arg	Leu	Glu	Leu	Lys	Asn	Lys	Gln
		660						665					670		
Lys	Pro	Trp	Pro	Leu	Lys	Lys	Lys	Asn	Ala	Thr	Phe	Arg	Ile	Phe	Gly
	675						680					685			

His

<210> 49
 <211> 23
 <212> DNA
 <213> Homo sapiens

<400> 49
 gcaaaggcca tcgcagaaga cat

23

<210> 50
 <211> 26
 <212> DNA
 <213> Homo sapiens

<400> 50
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26

<210> 51
 <211> 2187
 <212> DNA
 <213> Homo sapiens

<400> 51
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 gagcggcatg agagactccg ggagaagatg aggcggcgat tggaaatctgg tgacaagtgg 180
 ttctccctgg aattcttccc tcctcgaact gctgagggag ctgtcaatct catctcaagg 240
 tttgaccgga tggcagcagg tggccccctc tacatagacg tgacctggca cccagcaggt 300
 gaccctggct cagacaagga gacctcctcc atgatgatcg ccagcaccgc cgtgaactac 360
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 ggccatctgc acaaagctaa gcagctgggc ctgaagaaca tcatggcgct gcggggagac 480
 ccaatagggtg accagtggga agaggaggag ggaggcttca actacgcagt ggacctggtg 540
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 ggccaccccg aagcagggag ctttgaggct gacctgaagc acttgaagga gaaggtgtct 660
 gcgggagccg atttcatcat cacgcagctt ttctttgagg ctgacacatt cttccgcttt 720
 gtgaaggcat gcaccgacat gggcatcact tgccccatcg tccccgggat ctttcccatc 780
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 gtccctgacgc cctgcgttgg agccactcct gtcccgctt cctcctccac agtgctgctt 2040
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 catgggaacc tagtactctc tgctcta 2187

<210> 52
 <211> 20
 <212> PRT
 <213> Homo sapiens

<400> 52
 Phe Leu Leu Leu Tyr Ala Thr Gln Gln Gly Gln Ala Lys Ala Ile Ala
 1 5 10 15
 Glu Glu Met Cys
 20

<210> 53
 <211> 23
 <212> PRT

<213> Homo sapiens

<400> 53

Val	Val	Val	Val	Ser	Thr	Thr	Gly	Thr	Gly	Asp	Pro	Pro	Asp	Thr	Ala
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Arg	Lys	Phe	Val	Lys	Glu	Ile									
			20												

<210> 54

<211> 29

<212> PRT

<213> Homo sapiens

<400> 54

Ala	His	Leu	Arg	Tyr	Gly	Leu	Leu	Gly	Leu	Gly	Asp	Ser	Glu	Tyr	Thr
1				5					10					15	
Tyr	Phe	Cys	Asn	Gly	Gly	Lys	Ile	Ile	Asp	Lys	Arg	Leu			
			20					25							

<210> 55

<211> 19

<212> PRT

<213> Homo sapiens

<400> 55

Leu	Gln	Pro	Arg	Pro	Tyr	Ser	Cys	Ala	Ser	Ser	Ser	Leu	Phe	His	Pro
1				5					10					15	
Gly	Lys	Leu													

<210> 56

<211> 14

<212> PRT

<213> Homo sapiens

<400> 56

Phe	Val	Phe	Asn	Ile	Val	Glu	Phe	Leu	Ser	Thr	Ala	Thr	Thr
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<210> 57

<211> 17

<212> PRT

<213> Homo sapiens

<400> 57

Leu	Arg	Lys	Gly	Val	Cys	Thr	Gly	Trp	Leu	Ala	Leu	Leu	Val	Ala	Ser
1				5					10					15	
Val															

<210> 58

<211> 22

<212> PRT

<213> Homo sapiens

<400> 58
 Ile Pro Ile Ile Met Val Gly Pro Gly Thr Gly Ile Ala Pro Phe Ile
 1 5 10 15
 Gly Phe Leu Gln His Arg
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<210> 59
 <211> 6
 <212> PRT
 <213> Homo sapiens

<400> 59
 Ser Phe Ser Arg Asp Ala
 1 5

<210> 60
 <211> 41
 <212> PRT
 <213> Homo sapiens

<400> 60
 Ala Pro Ala Lys Tyr Val Gln Asp Asn Ile Gln Leu His Gly Gln Gln
 1 5 10 15
 Val Ala Arg Ile Leu Leu Gln Glu Asn Gly His Ile Tyr Val Cys Gly
 20 25 30
 Asp Ala Lys Asn Met Ala Lys Asp Val
 35 40

<210> 61
 <211> 9
 <212> PRT
 <213> Homo sapiens

<400> 61
 Lys Arg Tyr Leu Gln Asp Ile Trp Ser
 1 5